PROFILING PROGRAM EXECUTION TO IDENTIFY FREQUENTLY-EXECUTED PORTIONS AND TO ASSIST BINARY TRANSLATION

BACKGROUND

5   This application is a continuation of U.S. application serial no. 09/385,394, filed August 30, 1999, which is a continuation-in-part (C-I-P) of U.S. application serial no. 09/322,443, filed May 28, 1999, which is a continuation-in-part (C-I-P) of U.S. application serial no. 09/239,194, filed January 28, 1999, which are incorporated herein by reference.

The invention relates to execution of instructions for a computer of a first computer
10   architecture on a computer of a second, different architecture.

Each instruction for execution by a computer is represented as a binary number stored in the computer's memory. Each different architecture of computer represents instructions differently. For instance, when a given instruction, a given binary number, is executed by an IBM System/360 computer, an IBM System/38, an IBM AS/400, an IBM PC, and an IBM
15   PowerPC, the five computers will typically perform five completely different operations, even though all five are manufactured by the same company. This correspondence between the binary representation of a computer's instructions and the actions taken by the computer in response is called the Instruction Set Architecture (ISA).

A program coded in the binary ISA for a particular computer family is often called
20   simply "a binary." Commercial software is typically distributed in binary form. The incompatibility noted in the previous paragraph means that programs distributed in binary form for one architecture generally do not run on computers of another. Accordingly, computer users are extremely reluctant to change from one architecture to another, and computer manufacturers are narrowly constrained in modifying their computer architectures.

25   A computer most naturally executes programs coded in its native ISA, the ISA of the architectural family for which the computer is a member. Several methods are known for executing binaries originally coded for computers of another, non-native, ISA. In hardware emulation, the computer has hardware specifically directed to executing the non-native instructions. Emulation is typically controlled by a mode bit, an electronic switch: when a non-
30   native binary is to be executed, a special instruction in the emulating computer sets the mode bit and transfers control to the non-native binary. When the non-native program exits, the mode bit is reset to specify that subsequent instructions are to be interpreted by the native ISA. Typically, in an emulator, native and non-native instructions are stored in different address spaces. A

NE. At page 52, line 31, replace "the emulator and profiler contexts" with --context for emulator 316 and profiler 400--.

At page 53, line 8, replace "systems," with --systems 306, 312,--.

At page 53, line 31, replace the second instance of "system" with --system 306--.

At page 54, lines 28-29, replace "the emulator" with --emulator--.

At page 54, line 29, replace "The emulator" with --Emulator 316--.

At page 57, line 22, replace "EPC" with --EPC.EIP--.

At page 58, lines 14-15, replace "the tapestry operating system" with --Tapestry operating system 312--.

At page 62, lines 2, 3, 4 and 14, replace "EPC" with --EPC.EIP--.

At page 62, lines 16-17, replace "the operating system" with --Tapestry operating system 312--.

At page 63, line 18, replace "EPSW" with --EPC (error PC and program status word), in turn--.

At page 63, line 20, replace "EPSW" with --EPC--.

NE. At page 73, lines 23-24, replace "the X86 operating system are" with --X86 operating system 306 may be--.

NE. At page 73, line 25, replace "the operating system" with --X86 operating system 306--.

NE. At page 73, line 29, replace "the operating system" with --X86 operating system 306--.

NE. At page 73, lines 29-30, replace "the X86 operating system is sharing" with --X86 operating system 306 shares--.

At page 75, line 22, replace "the software emulator" with --software emulator 316 --.

At page 75, line 26, replace "the operating system" with --emulator 316 --.

At page 75, lines 29 and 30, replace "the emulator" with --emulator 316 --.

At page 76, line 10, replace "the emulator" with --emulator 316 --.

At page 76, lines 10-11, replace "the emulator" with --emulator 316 --.

At page 77, line 25, replace "the emulator" with --emulator 316 --.

At page 89, line 31, after "action 524." insert the sentence --The ring buffer write pointer, pointing to the next location in the ring buffer, is maintained in R15 ("RingBuf" of Table 1). After the collected profile packet is stored at the location indicated by R15, R15 is postincremented by the size of a profile packet.--.

At page 94, line 10, second instance, please replace "the emulator" with --emulator 316--.

At page 94, line 15, replace "the emulator" with --emulator 316 --.